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PATENT COOPERATION TREATY

PCT

REC'D 16 MAY 2001

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SMK/LP5831698	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) FOR FURTHER ACTION	
International application No. PCT/GB00/00197	International filing date (day/month/year) 25/01/2000	Priority date (day/month/year) 05/02/1999
International Patent Classification (IPC) or national classification and IPC C12N15/00		
Applicant PLANT BIOSCIENCE LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 1 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 30/08/2000	Date of completion of this report 14.05.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Burkhardt, P Telephone No. +49 89 2399 7456



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/00197

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-55 as originally filed

Claims, No.:

9-40 as originally filed

1-8 as received on 01/03/2001 with letter of 28/02/2001

Drawings, sheets:

1/10-10/10 as originally filed

Sequence listing part of the description, pages:

1-28, filed with the letter of 16.03.2000

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☒ furnished subsequently to this Authority in written form.
- ☒ furnished subsequently to this Authority in computer readable form.
- ☒ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☒ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/00197

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

see separate sheet

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	12 - 28, 30, 31, 33 - 39
	No:	Claims	1 - 11, 29, 32, 40
Inventive step (IS)	Yes:	Claims	30, 31, 33, 34
	No:	Claims	12 - 28 and 35 - 39
Industrial applicability (IA)	Yes:	Claims	1 - 40
	No:	Claims	

2. Citations and explanations

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/00197

Re Item I

Basis of the opinion

This written opinion is also based on the Sequence Listing (pages 1-28) as originally filed.

The amended claims filed with the letter of 28.02.2001 are formally acceptable under Article 34(2)(b) PCT.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

The following documents (D) are referred to in this written report; the numbering is following the order of the International Search Report:

- D1 Clarke and Dean, 1994. Mol. Gen. Genet. 242:81-89.
- D5 Schmidt *et al.*, 1996. Plant J. 9:755-765.

1. Interpretation of claims

1.1 Present claim 19 was interpreted as "A vector as claimed in claim 18 ..."

2. Article 33(2) PCT (Novelty)

2.1 Present claim 1 is directed to an isolated nucleic acid sequence encoding a polypeptide which alters the flowering time of a plant transformed with said nucleic acid.

Prior art document D5 (Figure 5) discloses Arabidopsis YAC clones (e.g. CIC16C4) that cover the whole region that is attributed to the FRI locus on chromosome 4 (D1, Figure 4). The nucleic acid sequence contained in these clones consequently encodes a polypeptide which alters the flowering time of a plant in which the sequence is introduced.

It may be true that D5 relates to a huge number of YAC clones and their

arrangement on chromosome 4. D5, however, discloses one clone (CIC16C4 in Contig I) that is covering the whole FRI locus. An inherent feature of this isolated nucleic acid sequence is its ability to alter the flowering time of a plant into which it is introduced. The YAC clone CIC16C4 therefore anticipates the subject-matter of present claim 1. Moreover, present claim 1 does not relate to a specific nucleic acid sequence. Consequently, the YAC clone of D5 is more than sufficient to anticipate the subject-matter of said claim.

Thus, claim 1 does not meet the requirements of Article 33(2) PCT. The same holds true for dependent claims 2 - 11, 29, 32 and for claim 40 directed to a nucleic acid sequence comprising the promoter region of a gene from the FRI locus.

2.2 The subject-matter of present claim 30, an isolated polypeptide comprising the amino acid sequence depicted in Figure 6 appears to be novel over the prior art presently available to the IPEA. Thus, present claim 30 meets the requirements of Article 33(2) PCT. The same holds true for dependent claim 31 as well as for claims 33 and 34 directed to antibodies for the polypeptide of claim 30.

2.3 The applicant is requested to note that even if formal novelty could be established for present claim 1 it still would not meet the requirements of Article 33(3) PCT. The subject-matter of claim 1 is derivable in an obvious way from D5 in view of D1.

3. Article 33(3) PCT (Inventive step)

3.1 Methods of producing or identifying known nucleic acid sequences (see 2.1) cannot be regarded as involving an inventive step. Therefore, present claims 12 - 17 do not meet the requirements of Article 33(3) PCT. A similar objection applies to the use of known sequences in vectors and for the transformation of host cells. Present claims 18 - 28 and 35 - 39 do also not meet the requirements of Article 33(3) PCT.

3.2 The prior art presently available to the IPEA does neither suggest nor teach ways to arrive at the subject-matter of present claims 30, 31, 33 and 34. Thus,

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/00197

claims 30, 31, 33 and 34 meet the requirements of Article 33(3) PCT.

Re Item VIII

Certain observations on the international application

1. The use of the term "capable of" throughout the claims refers to the intended function of a nucleotide/protein sequence. This is a non-distinctive characteristic and would not render the subject-matter of the present set of claims novel over the prior art (see also PCT Guidelines IV-7.6).
2. The wording of present claim 11 "... at least about ..." introduces ambiguity and renders the claim as such unclear (Article 6 PCT).
3. The term "soft fruit" in present claim 38 is unclear (Article 6 PCT). It is not suitable for defining the subject-matter in terms of technical features as required by Rule 6.3(a) PCT.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SMK/LP5831698	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 00197	International filing date (day/month/year) 25/01/2000	(Earliest) Priority Date (day/month/year) 05/02/1999
Applicant PLANT BIOSCIENCE LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☒ furnished subsequently to this Authority in written form.

☒ furnished subsequently to this Authority in computer readable form.

☒ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☒ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

ARABIDOPSIS THALIANA DERIVED FRIGIDA GENE CONFERRING LATE FLOWERING

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

6

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

National Application No

PCT/GB 00/00197

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/29 C07K14/415 C12N15/63 C12N15/82 C07K16/16
A01H1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12N C07K A01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, STRAND, BIOSIS, EMBASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CLARKE, J.H. & DEAN, C.: "Mapping FRI, a locus controlling flowering time and vernalization response in Arabidopsis thaliana" MOLECULAR & GENERAL GENETICS, vol. 242, no. 1, January 1994 (1994-01), pages 81-89, XP000864671 cited in the application abstract	1,2,18, 40
A	page 81, column 2, line 22 -page 82, column 1, line 20 page 83, column 2, line 35 -page 87, column 1, line 19; figure 4 page 87, column 2, line 36 -page 88, column 1, line 49 --- -/--	3-17, 19-39



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

11 July 2000

Date of mailing of the international search report

27/07/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Fuchs, U

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 00/00197

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EMBL database, Heidelberg, FRG accession number AF058919 16 April 1998 GEISEL, C.: "Arabidopsis thaliana BAC F6N23" XP002142318	5, 10, 18, 29, 31
A	the whole document	1-4, 6-9, 11-17
X	EMBL database, Heidelberg, FRG accession number B77833 16 January 1998 ROUNSLEY, S.D. ET AL.: "T29E23TR TAMU Arabidopsis thaliana genomic clone T29E23, genomic survey sequence" XP002142319	11
A	the whole document	13-17
A	SANDA, S. ET AL.: "Analysis of Flowering Time in Ecotypes of Arabidopsis thaliana" JOURNAL OF HEREDITY, vol. 88, no. 1, January 1997 (1997-01), pages 69-72, XP000864673 the whole document	1-40
A	SCHMIDT, R. ET AL.: "Detailed description of four YAC contigs representing 17 Mb of chromosome 4 of Arabidopsis thaliana ecotype Columbia" PLANT JOURNAL, vol. 9, no. 5, 20 October 1995 (1995-10-20), pages 755-765, XP000914995 cited in the application the whole document	1-18

PCT COOPERATION TREATY

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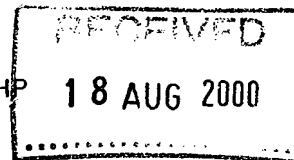
NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

KREMER, Simon, M.
Mewburn Ellis
York House
23 Kingsway
London WC2B 6HP
ROYAUME-UNI



Date of mailing (day/month/year) 10 August 2000 (10.08.00)		IMPORTANT NOTICE	
Applicant's or agent's file reference SMK/LP5831698			
International application No. PCT/GB00/00197	International filing date (day/month/year) 25 January 2000 (25.01.00)	Priority date (day/month/year) 05 February 1999 (05.02.99)	
Applicant PLANT BIOSCIENCE LIMITED et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 10 August 2000 (10.08.00) under No. WO 00/46358

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

Continuation of Form PCT/IB/308

**NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF
THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES**

Date of mailing (day/month/year) 10 August 2000 (10.08.00)	IMPORTANT NOTICE
Applicant's or agent's file reference SMK/LP5831698	International application No. PCT/GB00/00197
<p>The applicant is hereby notified that, at the time of establishment of this Notice, the time limit under Rule 46.1 for making amendments under Article 19 has not yet expired and the International Bureau had received neither such amendments nor a declaration that the applicant does not wish to make amendments.</p>	



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : C12N 15/00	A2	(11) International Publication Number: WO 00/46358 (43) International Publication Date: 10 August 2000 (10.08.00)
(21) International Application Number: PCT/GB00/00197 (22) International Filing Date: 25 January 2000 (25.01.00) (30) Priority Data: 9902660.1 5 February 1999 (05.02.99) GB (71) Applicant (for all designated States except US): PLANT BIOSCIENCE LIMITED [GB/GB]; Norwich Research Park, Colney Lane, Norwich, Norfolk NR4 7UH (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): JOHANSON, Urban [SE/SE]; Department of Plant Biochemistry, P.O. Box 117, S-221 00 Lund (SE). WEST, Joanne [GB/GB]; The Crescent, St. Ives, Huntingdon PE17 4TA (GB). DEAN, Caroline [GB/GB]; 19 Waverley Road, Norwich, Norfolk NR4 6SG (GB). (74) Agents: KREMER, Simon, M. et al.; Mewburn Ellis, York House, 23 Kingsway, London WC2B 6HP (GB).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>
(54) Title: PLANT GENE		
(57) Abstract <p>Disclosed are isolated nucleic acids obtainable from the FRI locus of plants which encode polypeptides capable of specifically altering, particularly delaying, the flowering time of a plant into which the nucleic acid is introduced. One preferred embodiment is the FRI nucleotide sequence which encodes the polypeptide of Fig 6 (see the sequence of Fig 5, particularly bases 362–2188 thereof) or sequences degeneratively equivalent to these. Also provided are variant sequences (e.g. alleles, orthologues, derivatives) and complementary sequences, plus vectors, host cells, plants and associated processes of production and methods of use e.g. for influencing or affecting flowering time in a plant by expression or suppression of FRI or variant sequences.</p>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
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CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
10 August 2000 (10.08.2000)

PCT

(10) International Publication Number
WO 00/46358 A3(51) International Patent Classification⁷: C12N 15/29,
C07K 14/415, C12N 15/63, 15/82, C07K 16/16, A01H
1/00Crescent, St. Ives, Huntingdon PE17 4TA (GB). DEAN,
Caroline [GB/GB]; 19 Waverley Road, Norwich, Norfolk
NR4 6SG (GB).

(21) International Application Number: PCT/GB00/00197

(74) Agents: KREMER, Simon, M. et al.; Mewburn Ellis,
York House, 23 Kingsway, London WC2B 6HP (GB).

(22) International Filing Date: 25 January 2000 (25.01.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
9902660.1 5 February 1999 (05.02.1999) GB(71) Applicant (for all designated States except US): PLANT
BIOSCIENCE LIMITED [GB/GB]; Norwich Research
Park, Colney Lane, Norwich, Norfolk NR4 7UH (GB).(81) Designated States (national): AE, AL, AM, AT, AU, AZ,
BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK,
DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL,
IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,
LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT,
RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA,
UG, US, UZ, VN, YU, ZA, ZW.(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent
(AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent
(AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU,
MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): JOHANSON, Ur-
ban [SE/SE]; Department of Plant Biochemistry, P.O. Box
117, S-221 00 Lund (SE). WEST, Joanne [GB/GB]; The

Published:

— With international search report.

[Continued on next page]

(54) Title: ARABIDOPSIS THALIANA DERIVED FRIGIDA GENE CONFERRING LATE FLOWERING



1 MSNYPPTVAA QPTTTANPLL QRHQSDQRRR ELPKIVETES TSMIDITQGS
51 KQPQFLKSID ELAAPSVAVE TPKRQFDLLQ KHIESIENAI DSKLESNGVV
101 LAARANNFHQ PHLSPRNHV SVETTVTVSQ PQSIVPETG NKPEGRMCE
151 LMCSKGLRKY IYANISDQAK LMEETPSALK LAKEPAKFVL DCIGKFTYLC
201 BRAFTKESPH SSARQVSLLI LBSFLMPDR GEGKVKIESW IDEASTAAV
251 AWRKRLMTEG GLAAAEKMDA RGLLLLVACF QVTSNFRSTD LLDLIRHSGS
301 MEIAGALKRS QPLVPMVSGI VESSIKRGMH IEALEMVYTF QMEDKPSAAL
351 VLTSFLIMSK ESFERAKRKA QSLAPKERA TKQLAVLSSV MQCMETHKLD
401 PAKELPGWQI KEQIVSLEKD TLQLDKEMEE KARSLSLMEZ AALAKRHYNO
451 QIKRPRLSPM EMPFVTSSSY SPIYRDREFF SQRDDQOEI SALVSSYLGP
501 STSPPHRSRR SPEYVFLPK GGLGRSVYAY ERLAPNSYSP GHGRLHROY
551 SPGLVHGQRH PLQYSPFING QQQLFYGIQR VYRHSPSEER YLGLSNQREP
601 RSMSSLDPK

(57) Abstract: Disclosed are isolated nucleic acids obtainable from the FRI locus of plants which encode polypeptides capable of specifically altering, particularly delaying, the flowering time of a plant into which the nucleic acid is introduced. One preferred embodiment is the FRI nucleotide sequence which encodes the polypeptide of Fig 6 (see the sequence of Fig 5, particularly bases 362-2188 thereof) or sequences degeneratively equivalent to these. Also provided are variant sequences (e.g. alleles, orthologues, derivatives) and complementary sequences, plus vectors, host cells, plants and associated processes of production and methods of use e.g. for influencing or affecting flowering time in a plant by expression or suppression of FRI or variant sequences.

WO 00/46358 A3



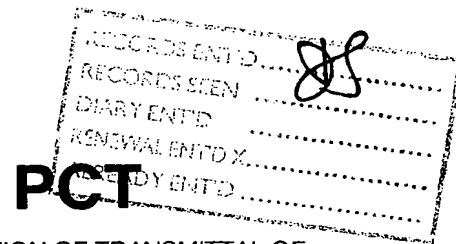
(88) Date of publication of the international search report:
30 November 2000

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CLAIMS

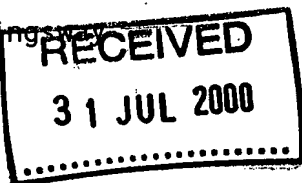
1. An isolated nucleic acid obtainable from the FRI locus of a plant, which nucleic acid encodes a polypeptide which is capable of specifically altering the flowering time of a plant into which the nucleic acid is introduced.
5
2. A nucleic acid as claimed in claim 1 which is capable of delaying the flowering time and thereby extending a vegetative phase in the plant.
10
3. A nucleic acid as claimed in claim 1 or claim 2 which comprises an FRI nucleotide sequence which encodes the polypeptide of Fig 6.
- 15 4. A nucleic acid as claimed in claim 3 wherein the FRI nucleotide sequence consists of any of:
(i) the sequence of Fig 4;
(ii) the sequence of Fig 5;
(iii) bases 362-2188 inclusive of Fig 5;
20 or is degeneratively equivalent to any of these.
5. An isolated nucleic acid which comprises a variant sequence which is a homologous variant of the FRI nucleotide sequence of claim 4 and which shares at least about 60%
25 identity therewith.
6. A nucleic acid as claimed in claim 5 wherein the variant sequence encodes a polypeptide which is capable of specifically altering the flowering time of a plant into
30 which the nucleic acid is introduced.
7. A nucleic acid as claimed in claim 5 or claim 6 wherein the variant sequence is an FRI allele.
- 35 8. A nucleic acid as claimed in claim 5 or claim 6 wherein the variant sequence is an FRI orthologue obtainable from a plant species other than *Arabidopsis thaliana*.

PATENT COOPERATION TREATY



From the INTERNATIONAL SEARCHING AUTHORITY

To:
KREMER, Simon
Mewburn Ellis
York House, 23 King's Cross
London WC2B 6HP
UNITED KINGDOM



NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference SMK/LP5831698	Date of mailing (day/month/year) 27/07/2000
International application No. PCT/GB 00/ 00197	International filing date (day/month/year) 25/01/2000
Applicant PLANT BIOSCIENCE LIMITED et al.	

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer <p style="text-align: center; font-size: 1.2em;">Renate Jordan</p>
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NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

P ENT COOPERATION TREA

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
 United States Patent and Trademark
 Office
 Box PCT
 Washington, D.C.20231
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 29 September 2000 (29.09.00)	
International application No. PCT/GB00/00197	Applicant's or agent's file reference SMK/LP5831698
International filing date (day/month/year) 25 January 2000 (25.01.00)	Priority date (day/month/year) 05 February 1999 (05.02.99)
Applicant JOHANSON, Urban et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 30 August 2000 (30.08.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Juan Cruz Telephone No.: (41-22) 338.83.38
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